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LONDA, BRUCE S.
NORRIS MCLAUGHLIN & MARCUS, PA
875 THIRD AVE, 8TH FLOOR
NEW YORK, NY 10022

EXAMINER	
NGUYEN, TU MINH	

ART UNIT	PAPER NUMBER
3748	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/521,665	POTT ET AL.	
	Examiner	Art Unit	
	TU M. NGUYEN	3748	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 November 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *37-59* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *37-59* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 January 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application.
6) ☐ Other: _____.

DETAILED ACTION

1. An Applicant's Request for Continued Examination (RCE) filed on November 3, 2009 has been entered. Per instruction from the RCE, an enclosed Applicant's Amendment has been entered. Claims 49 and 53 have been amended; and claims 54-59 have been added. Overall, claims 37-59 are pending in this application.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 37-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Abe et al. (U.S. Patent 5,802,845).

Re claim 37 and 38, as shown in Figure 5, Abe et al. disclose an internal combustion engine installation having a gasoline engine (ENGINE) (see lines 30-33 of column 4) and a catalyst system which is downstream from the gasoline engine and has at least one catalyst (Catalyst A), wherein the catalyst system (Catalyst A) has a total catalyst volume (KV) of less than 0.8 x the engine displacement (VH) (see lines 61-65 of column 9), and that the average specific noble metal loading of the at least one catalyst of the catalyst system is less than 3.59

g/dm^3 (lines 44-45 of column 5), the total mass of noble metal of the catalyst system being less than 2 g per liter of engine displacement (VH).

Abe et al., however, fail to disclose that the engine installation is a directly injected gasoline type engine which is adapted for operating in a stratified manner only to a small extent in terms of all operation points of the direct injected gasoline engine.

Abe et al. disclose the claimed invention except for applying the invention to a directly injected gasoline type engine adapted for operating in a slightly stratified manner only. It would have been obvious to one having ordinary skill in the art at the time the invention was made to apply the invention of Abe et al. to a directly injected gasoline type engine, since the recitation of such amounts to an intended use statement. Note that both "directly injected gasoline engine" and "carburetor gasoline engine" generate exhaust gases containing harmful emissions of HC, NOx, soot, CO, etc, that require purification before the gases can be released to the atmosphere; and the mere selection of the purification system of Abe et al. for use in a directly injected gasoline engine would be well within the level of ordinary skill in the art.

Re claim 39, since the engine of Abe et al. has a catalyst substantially the same size as that of the pending application, it is obvious that in the engine installation of Abe et al., the catalyst system has a catalyst volume (KV) of less than 1.15 L per 100 kW of rated horsepower (PNENN) and especially of less than 1.00 L per 100 kW.

Re claim 40, as shown in Figure 8, in the engine installation of Abe et al., the catalyst system consists of at least two main catalysts (Catalyst B and Catalyst C), arranged in parallel with at least one pre-catalyst (EHC).

Re claim 41, in the engine installation of Abe et al., the average specific noble metal loading of the at least one catalyst (Catalyst A) of the catalyst system is especially not more than 2.15 g/dm^3 (see lines 44-45 of column 5).

Re claims 42 and 47, in the engine installation of Abe et al., the pre-catalyst or pre-catalysts (EHC) have a specific noble metal loading, which is higher by up to 70%, especially by up to 50% and preferably by up to 30% than that of the main catalyst (Catalyst A) (see lines 23-49 of column 13 and lines 44-45 of column 5).

Re claim 43, in the engine installation of Abe et al., the total mass of noble metal of the catalyst system is less than 1.6 g per liter of engine displacement (VH) of the gasoline engine, especially less than 1.2 g per liter of engine displacement, preferably at less than 1.0 g per liter of engine displacement and, particularly preferably, less than 0.8 g per liter of engine displacement.

Re claim 44, in the engine installation of Abe et al., the total mass of noble metal of the catalyst system is less than 3 g per 100 kW of rated horsepower of the gasoline engine, particularly less than 2.5 g per 100 kW of rated horsepower, preferably less than 2.1 g per 100 kW of rated horsepower and particularly preferably less than 1.7 g per 100 kW of rated horsepower.

Re claim 48, in the engine installation of Abe et al., the catalyst or catalysts of the catalyst system, especially of the at least one catalyst (Catalyst A) are based on a ceramic support (see lines 31-37 of column 5).

Re claim 50, in the engine installation of Abe et al., the at least one pre-catalysts (EHC) has a support based on metal foil (lines 20-23 of column 7).

Re claim 52, in the engine installation of Abe et al., the gasoline engine (12) is adapted for stratified operation in less than 7% of all operating points, especially in less than 5% of all operating points and preferably in less than 3% of all operating points

Re claim 53, in the engine installation of Abe et al., the gasoline engine is naturally aspirated.

Re claim 45, the engine installation of Abe et al. discloses the invention as cited above, however, fails to disclose that the at least one catalyst (Catalyst A) or the at least one pre-catalyst (EHC) is at a distance of less than 800 millimeter exhaust gas pipeline length from the nearest outlet valve of the gasoline engine, particularly less, than 500 mm of exhaust gas pipeline length and preferably less than 300 mm of exhaust gas pipeline length.

Abe et al. disclose the claimed invention except for specifying an optimum range of distance between the at least one catalyst (Catalyst A) or the at least one pre-catalyst (EHC) and the nearest outlet valve of the engine of less than 300 mm. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a specific optimum range of said distance, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Re claim 46, the engine installation of Abe et al. discloses the invention as cited above, however, fails to disclose that the at least one pre-catalyst (EHC) and the at least one downstream main catalyst (Catalyst A) are at a distance of more than 100 mm from one another.

Abe et al. disclose the claimed invention except for specifying an optimum range of distance between the at least one downstream catalyst (Catalyst A) and the at least one pre-

catalyst (EHC) of less than 100 mm. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a specific optimum range of said distance, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Re claims 49 and 51, in the engine installation of Abe et al., the catalyst or catalysts (Catalyst A) are based on a ceramic support, have a cell density of more than 400 cpsi (see lines 49-53 of column 12); and that the at least one pre-catalyst (EHC) has a cell density of more than 450 cpsi (see lines 37-44 of column 13). Abe et al., however, fail to disclose that the catalyst (Catalyst A) and the pre-catalyst (EHC), each has a cell density of more than 500 cpsi.

Abe et al. disclose the claimed invention except for specifying an optimum range of cell density for the catalyst (Catalyst A) and the at least one pre-catalyst (EHC) of more than 500 cpsi. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a specific optimum range of cell density for each of the Catalyst A and the EHC, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Re claim 54 and 57, as shown in Figure 5, Abe et al. disclose an internal combustion engine installation having a gasoline engine (ENGINE) (see lines 30-33 of column 4) and a catalyst system which is downstream from the gasoline engine and has at least one catalyst (Catalyst A), wherein the catalyst system (Catalyst A) has a total catalyst volume (KV) of less than 0.8 x the engine displacement (VH) (see lines 61-65 of column 9), and that the average

specific noble metal loading of the at least one catalyst of the catalyst system is less than 3.59 g/dm^3 (lines 44-45 of column 5), the total mass of noble metal of the catalyst system being less than 2 g per liter of engine displacement (VH).

Abe et al., however, fail to disclose that the engine installation is a directly injected gasoline type engine which is adapted for operating in a stratified manner only to a small extent in terms of all operation points of the direct injected gasoline engine; and that a center position of an injection jet at an outlet of an injection nozzle has an injection angle ranging from -5° to -45° or 70° to 90°, relative to the circular cross-section of the cylinder.

Abe et al. disclose the claimed invention except for applying the invention to a directly injected gasoline type engine adapted for operating in a slightly stratified manner only. It would have been obvious to one having ordinary skill in the art at the time the invention was made to apply the invention of Abe et al. to a directly injected gasoline type engine, since the recitation of such amounts to an intended use statement. Note that both "directly injected gasoline engine" and "carburetor gasoline engine" generate exhaust gases containing harmful emissions of HC, NOx, soot, CO, etc, that require purification before the gases can be released to the atmosphere; and the mere selection of the purification system of Abe et al. for use in a directly injected gasoline engine would be well within the level of ordinary skill in the art.

It is well known to those with ordinary skill in the art that the invention of Abe et al. is applicable to a directly injected gasoline type engine having at least one fuel injection nozzle to inject a fuel directly into a combustion chamber; and that a center position of an injection jet at an outlet of the injection nozzle has an injection angle ranging from -5° to -45° or 70° to 90°, relative to the circular cross-section of the cylinder, wherein a negative degree corresponds to an

alignment with respect to the cylinder head, and wherein 0° corresponds to an alignment parallel to the circular cross-section of the cylinder, and further wherein a positive degree corresponds to an alignment in a direction of a crank-shaft of the directly injected gasoline engine. Therefore, such disclosure by Abe et al. is notoriously well known in the art so as to be proper for official notice.

Re claims 55 and 58, in the engine installation of Abe et al., the directly injected gasoline engine has an injection pressure of more than 40 bar and less than 2000 bar, which is the range of injection pressure for most typical directly injected gasoline engines.

Re claims 56 and 59, the engine installation of Abe et al. discloses the invention as cited above, however, fails to disclose that injection commences at 330° to 150° before top dead center for the directly injected gasoline engine.

It is well known to those with ordinary skill in the art that the invention of Abe et al. is applicable to a directly injected gasoline type engine having at least one fuel injection nozzle to inject a fuel directly into a combustion chamber; and that injection commences at 330° to 150° before top dead center. Therefore, such disclosure by Abe et al. is notoriously well known in the art so as to be proper for official notice.

Response to Arguments

4. Applicant's arguments with respect to the references applied in the previous Office Action have been fully considered but they are not persuasive.

In response to applicant's argument that since Abe et al. disclose a catalyst A which has a total catalyst volume of more than the engine displacement and a total mass of noble metal of the

catalyst system of about 80 g/ft^3 (2.82 g/L), Abe et al. fail to disclose or teach a catalyst system having a total catalyst volume of less than 0.8 x the engine displacement; and that a total mass of noble metal of the catalyst system of less than 2 g/L of engine displacement (pages 14-16 of Applicant's Amendment), the examiner respectfully disagrees.

The text on lines 61-65 of column 9 in Abe et al. reads as follows: "*The volume of the catalyst A is in the range of about 50 to 200% of the displacement of engine. The catalyst A may be constituted of a single honeycomb structure or a plurality of the honeycomb structures.*" (emphasis added by the examiner). If one having ordinary skill in the art is to use the lower end (i.e., 50%) of the range disclosed by Abe et al., one would immediately recognize that Abe et al. clearly teach or suggest a catalyst system having a total catalyst volume of less than 0.8 x the engine displacement.

The text on lines 44-45 of column 5 in Abe et al. reads as follows: "*The total amount of the supported noble metal in the catalyst is in the range of 20 to 130 g/ft^3*,". So, if one having ordinary skill in the art is to use the lower end (i.e., 20 g/ft^3) of the range disclosed by Abe et al., one would get the total mass of noble metal of the catalyst system in Abe et al. of approximately 0.71 g/L of engine displacement. Therefore, Abe et al. clearly teach a catalyst system having a total mass of noble metal in the catalyst system of less than 2 g per liter of engine displacement.

Prior Art

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure and consists of three patents: Ogawa et al. (U.S. Patent 6,602,165), Kobayashi (U.S. Patent 7,188,607), and Maruyama (U.S. Patent 7,207,315) further disclose a state of the art.

Communication

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571) 272-4862.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (571) 272-4859. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Tu M. Nguyen/

TMN

Tu M. Nguyen

December 19, 2009

Primary Examiner

Art Unit 3748